



Epic adventure

JSC engineers test methods to extract oxygen from water on STS-69. Story on Page 3.



Back to work

Rockwell International technicians complete work on fleet's oldest shuttle. Photo on Page 4.

Space News Roundup

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No. 14

Space station passes major design review

The International Space Station has passed its second major design review since the program was restructured in 1993, NASA officials announced this week.

The three-day Incremental Design Review, which was held March 28-30 at JSC, assures that the station, as designed, can be flown successfully into orbit, assembled, operated and put to use for research and technology development through the first phase of assembly flights.

The successful review by NASA, its international partners and contractors "reassures us we will continue to meet our schedule and cost targets," said Space Station Program Manager Randy Brinkley. "I am very pleased with the work of the entire space station team. We have set very ambitious goals and deadlines which we continue to meet."

The IDR was a comprehensive assessment of the integrated systems engineering approach being used by the program, concentrating on hardware being launched on the first six U.S. shuttle flights as well as the first five Russian launches.

Teams of engineers from NASA, the international partners and contractors have been working closely since October to identify issues, assess effects throughout the station's systems and identify corrective actions.

IDRs will be conducted each year, through the completion of the station in 2002, to ensure the integrity of the station design as it matures.



JSC Photos by Robert Markowitz



SPACE MEDICINE—The benefits of medical research in space came to Houston this week during a conference hosted by NASA and the AIAA. Top: Hank Huber, right, of the Life Sciences Project Division, explains the NASA-developed bi-directional telemetry that runs pacemakers to Sen. Kay Bailey Hutchison, R-Texas, left, as Joyce Schultz, center left, and Pamela Linn, center right, both of Lockheed-Martin Marietta, look on. Left: JSC Director Dr. Carolyn Huntoon talks with Dr. Michael DeBakey, right, of Baylor College of Medicine, and NASA Administrator Daniel S. Goldin.

Columbia returns to fleet next week

Engineers at Kennedy Space Center continue preparations for June's scheduled launch of *Atlantis* on the first shuttle-Mir docking mission, STS-71, as technicians gear up for the return of the oldest shuttle in the fleet to Florida for its next flight in September.

The veteran shuttle *Columbia* is being readied for its ferry flight from Palmdale, Calif., back to Florida, following six months of maintenance work and hardware improvements. *Columbia* is scheduled to arrive back at KSC on April 12th, the 14th anniversary of its first launch on the first shuttle mission, STS-1.

Columbia will then be prepared for blastoff in late September on STS-73, the second flight of the United States Microgravity Laboratory.

If weather permits, *Columbia* and its Shuttle Carrier Aircraft will make a stop at Ellington Field, where employees would have an opportunity to see the piggy-back pair. Plans call for the SCA to depart Palmdale April 11 and arrive here at mid-afternoon, staying overnight outside Hangar 990 before continuing on to Florida. For the latest information on the stopover, call the Employee Information Service at x36765.

Meanwhile, with the Spacelab

science module installed in *Atlantis'* cargo bay and the orbiter's three main engines secured in position, workers now are in the final stages of checking various systems before the scheduled move of *Atlantis* from its maintenance hangar to the Vehicle Assembly Bldg. on April 19. There, it will be mated to its solid rocket boosters and external fuel tank. *Atlantis* is set to be



hailed to Launch Pad 39-A a week after that for final prelaunch work.

The five NASA astronauts selected for the first docking mission with the Russian Space Station, Commander Hoot Gibson, Pilot Charlie Precourt and Mission Specialists Ellen Baker, Greg Harbaugh and Bonnie Dunbar, are to participate in the tradition-

al Crew Equipment Interface Test this weekend to inspect the payload bay and various hardware associated with the Orbiter Docking System and the Spacelab workshop.

They will be joined by two Russian cosmonauts for launch, Anatoly Solovoyev and Nikolai Budarin, who will take over control of Mir from the three current occupants of the space station after *Atlantis'* docking, including U.S. Astronaut Norm Thagard. Solovoyev and Budarin are scheduled to arrive at JSC in early May to complete their shuttle training.

Please see **LAUNCH**, Page 4

Astronauts train for Mir stays; Thagard busy with research

Norm Thagard continues with research on board the Russian Mir space station while plans are under way for the next two Americans to travel to the orbiting station.

Astronaut Shannon Lucid will be the second American to be a prime crew member during a five-month stay aboard the Mir and Jerry Linenger will be the third American to fly to the orbital laboratory. Both astronauts are expected to make their trips in 1996. John Blaha will serve as backup to Lucid and Scott Parazynski will act as backup to Linenger. Lucid and Blaha have been train-

ing since February in Star City, Russia. Linenger and Parazynski will begin training at the Gagarin Cos-

monaut Training Center in late May. Blaha and Parazynski will continue training at Star City for stays aboard Mir on future missions.

These assignments continue the U.S./

Russia human space flight cooperation, which consists of a three-phased program.

Phase one includes seven planned shuttle-Mir missions

between 1995 and 1997, including rendezvous, docking and crew transfers. The shuttle will assist with

crew exchange, resupply and payload activities for Mir. Russian cosmonauts have flown on two shuttle missions — STS-60 in 1994 and STS-63 last month. Four or more

U.S. astronaut stays aboard Mir are planned, totaling nearly two years of on-orbit time.

Phase two is the joint development of the core International

Space Station. Phase three is the expansion of the station to include all of the international partners.

Lucid, 52, has flown four times aboard the shuttle. She was a mission specialist on STS-51G in June 1985, STS-34 in October 1989, STS-43 in August 1991 and STS-

58 in October 1993.

Blaha, 52, has flown on four shuttle missions, STS-29 in March 1989, STS-33 in November 1989, STS-43 in August 1991 and STS-

58 in October 1993.

Linenger, 40, flew on *Discovery's* STS-64 mission in September 1994 and Parazynski, 33, was a member of *Atlantis'* STS-66 crew in November 1994.

Meanwhile, the heart's adaptation to space was the focus of several activities on board the Russian Space Station Mir this week as Thagard surpassed the space shuttle duration record set a few

weeks ago by the STS-67 crew. Thagard was launched on his historic mission on Mir on March 14, and since then has spent more than

Please see **THAGARD**, Page 4



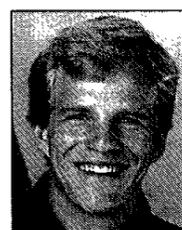
Lucid



Linenger



Blaha



Parazynski

Sonny Carter Training Facility honors late astronaut's memory

By Karen Schmidt

A structure that soon will begin helping astronauts develop techniques for assembling an international outpost in space was renamed the Sonny Carter Training Facility last Friday in honor of a man who dreamed of someday working on that outpost.

McDonnell Douglas Aerospace and JSC named the facility near Ellington Field that will house a neutral buoyancy laboratory in honor of the late astronaut M.L. "Sonny" Carter, who was instrumental in developing many of the current space-walking techniques used by astronauts.

JSC Director Dr. Carolyn L.

Huntoon welcomed a crowded room of dignitaries and Carter's family members and fellow workers.

"I know that some of you have come along way to share in this celebration of a special human being who meant so much to us," Huntoon said.

Friday's ceremony featured special tributes to Carter from Michael Mott, associate deputy administrator, NASA Headquarters; Dr. Willard Olsen, senior vice president of McDonnell Douglas Aerospace; Dave Leestma, director of Flight Crew Operations, and Randy Brinkley, manager of the International Space Station Program.

"When the administrator talks about NASA, he often talks about

contributions to America's future," Mott said. "I know of no one who better exemplified that than Sonny Carter."

Carter died April 5, 1991, in a commuter plane crash. Carter flew on STS-33, a Department of Defense mission. At the time of his death, he was training for STS-42.

"Sonny was truly a great American. Sonny was a remarkable and gifted individual with energy and drive and a spirit that touched everyone around him. This is a fitting and appropriate way for us to establish a memorial for someone who lived life to its fullest and dedicated his life to the mission of human space flight that this build-

Please see **GORE**, Page 4



JSC Photo by Robert Markowitz

JSC Director Dr. Carolyn Huntoon speaks at a Friday ceremony naming the Sonny Carter Training Facility near Ellington Field. Joining Huntoon, from left, are Michael Mott, associate deputy administrator from NASA Headquarters; Dave Leestma, director of Flight Crew Operations, and Randy Brinkley, manager of the International Space Station Program.

JSC

Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Store from 10 a.m.-2 p.m. Monday-Thursday and 9 a.m.-3 p.m. Friday. For more information, call x35350 or x30990.

Coppelia ballet: The Clear Lake Metropolitan Ballet will perform Coppelia at 8 p.m. April 7, 8 and at 2 p.m. April 8, 9 at the University of Houston Clear Lake Bayou Theater. Tickets cost \$8.

Snow White: Snow White and the Seven Dwarfs, noon April 8 at the Summit. Tickets cost \$12.

Easter Party: Easter party from 10 a.m. - noon April 15 at the Gilruth. Tickets cost \$4 for children and \$1 for adults.

Gershwin songs: Celebrate the songs of Gershwin at 8 p.m. April 28 at Clear Lake Presbyterian Church. Tickets cost \$8 for adults and \$5 for students and seniors.

International Festival: Houston International Festival April 20-30. Tickets cost \$3.

JSC Picnic: The JSC picnic April 22 at Astroworld. Tickets cost \$20. Includes all attractions and all-you-can-eat barbecue dinner.

Home Tour: Galveston Home tour May 6, 7, 13 or 14. Tickets cost \$13.75.

Ice Skating: World Championship Ice Skating 8 p.m. June 15 at the Summit. Tickets cost \$30.50 for upper prom, \$45.50 for lower prom.

Loving Feelings: Loving Feelings Concert at 7 p.m. Sept. 30 at the Summit. Tickets cost \$32.50.

Seaworld: Seaworld tickets cost \$23.50 for adults and \$16.25 for children 3-11.

Astroworld: Astroworld early bird tickets cost \$14.70. Season passes cost \$45.50.

Six Flags: Six Flags tickets cost \$23.70 for a one day pass, \$31.75 for two day pass and \$20.30 for supersaver not valid on weekends in June, July and August.

Fiesta Texas: Fiesta Texas tickets cost \$20.35 for adults and \$15.80 for children 4-11 and senior citizens over 55.

Moody Gardens: Discount tickets for two of three different attractions: \$9.50

Space Center Houston: Discount tickets, adult, \$8.75; child (3-11), \$7.10.

Metro tickets: Passes, books and single tickets available.

Movie discounts: General Cinema, \$4.75; AMC Theater, \$4; Loew's Theater, \$4.75.

Stamps: Book of 20, \$6.40.

JSC history: *Suddenly, Tomorrow Came: A History of the Johnson Space Center.* Cost is \$11.

Upcoming events: Joseph and the Amazing Technicolor Dreamcoat, Schlitterbahn and Splashtown tickets available soon.

JSC

Gilruth Center News

EAA badges: Dependents and spouses may apply for photo identification badges from 7 a.m.-9 p.m. Monday-Friday; and 8 a.m.-4 p.m. Saturdays. Dependents must be between 16 and 23 years old.

Weight safety: Required course for employees wishing to use the weight room is offered from 8-9:30 p.m. April 11 and April 27. Pre-registration is required. Cost is \$5.

Defensive driving: Course is offered from 8:15 a.m.-3 p.m. Saturday. Next class is May 13. Cost is \$19.

Exercise: Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays.

Aikido: Martial arts class meets from 5-7 p.m. Tuesdays and Wednesdays. Cost is \$25 per month. New classes begin the first of each month.

Country dancing: Beginners class meets from 7-9 p.m. Mondays; advanced class meets from 8:30-10 p.m. Mondays. Partners are required. For additional information, contact the Gilruth Center at x33345.

Ballroom dancing: Ballroom dancing classes. Cost is \$60 per couple. For additional information call the Gilruth Center at x33345.

Volleyball league: Registration for volleyball will be held at 7 a.m. April 18 and 19 for mixed leagues, 7 a.m. April 18 for either men's or women's league. For additional information, contact the Gilruth Center at x33345.

Basketball league: Registration for basketball will be held at 7 a.m. April 20 for all men's league and men over 35 league. For additional information, contact the Gilruth Center at x33345.

Fitness program: Health Related Fitness Program includes a medical examination screening and a 12-week individually prescribed exercise program. For more information, call Larry Wier at x30301.

JSC

Swap Shop

Property

Rent: Breckenridge, CO, 4-3-loft, sleeps 12, panoramic views of ski slope. 303-482-9124.

Sale: KSC, FL, waterfront, 3-2-2, Canal direct to river, new seawall/dock, open split plan, patio, hot tub, 7% assumable. 407-264-0678.

Sale: 290 & Huffmeister, 3-2-2A, new carpet, paint kitchen, CF, deck, assumable \$393/mo; possible trade for equity, \$65k. 992-3662 or 286-3161.

Sale: 22 acres 12k mi out of Sequin, Tx, nice homesite, crops, etc. x37426 or 484-5860.

Sale: El Lago, 3500 sq ft, 6 bedrooms, colonial style house, wooden floors, \$150k. 326-4973.

Rent: Galveston condo, furniture, sleeps 6, Seawall Blvd & 61st St, wkend/wkly/dly rates. Magdi Yassa, 333-4760 or 486-0788.

Sale: San Leon, herb farm, 2.5 acres, 3-2, new 16x80 mobile home, 30x50 green house, 30x30 gar, large pond, fenced. 333-6277 or 339-3562.

Sale: LC, 3-2-2A, new roof/kitchen, large yard, near CCHS, \$71k. x37176 or 554-2487.

Sale: Clear Lake, Cloisters condo, 1-1-w/study, carport, french doors, FPL, nice view. 286-9478.

Cars & Trucks

'80 Corvette, PS/PW/PD, 350 auto, needs carpet, \$6.5k firm. Steve, 947-3270.

'83 Olds Tornado, 307 V8, all power, \$2k/obo. Steve, 947-3270.

'86 Pontiac Fiero GT, black, 50k mi, loaded, garage kept, \$6.5/obo. Matt, x30853 or 488-2585.

'77 Pontiac Bonneville, 110k mi, engine is good, body needs work, \$500/obo. x32066 or 332-4608.

'89 Olds Cutlass Supreme, 2 dr, hard top, 64k mi, good cond, loaded, \$5.6k. James, 991-0533.

'64.5 Mustang, red, 289, looks & runs good, \$3k/obo. 486-0972.

'84 Honda Sabre VF1100S, black & silver, 41k mi, new tires/brakes, \$1.8k. B.J., x35570 or 332-5422.

'72 Olds Cutlass, not working, interior/exterior in good shape, \$200/obo. Linda, x48802 or 480-3187.

'92 Geo Metro, blue, A/C, AM/FM stereo, ex condition, \$4.5k/obo. Graeme, x36357 or 522-2005.

'93 Geo Storm, 5 speed, 35k mi, ex condition, A/C, 2 dr, AM/FM/cass, \$13.9k. 738-9119.

'92 Cougar LS, V6, AT/PS/PB, cruise, A/C, 40k mi, ex condition, \$10k firm. Singh, x31610.

'91 Toyota Camry, 52k mi, auto, A/C, cruise, AM/FM/cass, ex condition, \$8.7. 326-4316.

'93 Jeep Cherokee Country, red/gold, 4 dr, 2 WD, pwr windows, pwr brakes, pwr locks, 6 cyl, 54k mi, ex condition, \$14.5k. Mike, x34383.

'85 Nissan King cab pickup, \$1,250. x38976 or 409-925-5230.

Travel trailer, 25' Avion, good condition, \$3k. 554-6138.

'92 Mazda B2200, LE-5 pkg, auto, tint, ex condition, 31k mi, factory warranty. Barry, x38410 or 286-5139.

'93 MX-6, hunter green w/taupe inter, 5 speed, loaded, AM/FM/cass, alarm, auto, sunroof, ex con-

dition, 27k mi, \$15.6k. 486-2414.

Cycles

'82 Yamaha Maxim 550, 20k mi, \$1.1k. 337-2387.

'91 PW50 motorcycle, \$900. 337-6115.

'86 Kawasaki Ninja 100CR, 17k mi, ex cond, new rear tire/chain/procket, tuneup, \$3.5k. x37363.

Ross 27" ten speed touring bicycle, mens 23" frame, ex shape, extras, \$65. x37010 or 334-2612.

Boats & Planes

'81 Catalina 25, 7.5 Evinrude O/B, bimini, marine head, good condition, \$7.5/obo. 334-6615.

Hobie Cat 16", sailboat, trailer, mesh trampoline, dbl trap, extras, \$1,150. 996-5739.

'88 Invader, 210 Cuddy cabin, I/O 200 Hp Merc, galvanized trailer, loaded, great condition. 997-6141.

'91 Hobie Power Skiff, 15', center console, 50 Hp Pro-Yamaha, Sportsman trailer, \$6.8k. 335-0775.

'88 Thundercraft 18' Bowrider, Merc 140 Hp I/O, galvanized trailer, ski equipment, life preservers, rafts, \$5.5k. Luis, x47385 or 484-6462.

Windsurfers, Alpha 215RS w/7.2M & 5.5M sails, \$395; Alpha 110G w/6.3M & 4.6M sails, \$295. Stan, x34057 or 488-6822.

'70 Pearson, 26' sailboat, marine head, grill, sleeps 4, nice boat, \$6.9k. David or Beth, 484-7061.

'86 Centarian competition ski boat, 350cc inboard engine, new interior, runs great, trailer, \$8k; Skiman dry suit, medium, \$150. Gregg, x31250 or 474-4271.

'90 2-Kawasaki Tandem Sports, w/double trailer, ex condition, \$6.5k. Kirk, 649-1633.

'85 Eliminator ski boat, 19'6" w/350 Chevy motor, runs good, \$5.5k. 337-6215.

Mike Myers surfboard, 6'2" Thruster, excellent condition, \$215. Sean, 488-4527.

Audiovisual & Computers

Mac II, 8 MB RAM, 130 MB HD, color monitor, mouse, \$700; 286 computer, 1 MB RAM, 40 MB HD, extras, \$200. 996-5739.

Brother Word processor, #WP2200, spreadsheets, framing function, grammar check, \$135. 554-6138.

Citizen printer, "CSX-140" w/GSX color option, \$225. Magdi Yassa, 333-4760 or 486-0788.

486DX2-80, 420 HD, 2 FD, 6 MB RAM 14 SVGA, #1.075; 2 MB, 72 pin SIMM, \$65. x35549 or 554-7104.

Tektronix 4105 Graphics terminal & 4695 color printer, \$400/both. 328-3840.

Pocket cellular phone w/leather case, charger, longlife battery, special rate plane w/\$100 credit on 1st bill, no activation fee, \$200. Gregg, x31250.

Doom II on CD-ROM, \$35/obo. x33653 or 470-9387.

14" VGA, 640 x 480 monitor w/ISA Bus Orchid Pro Designer II video card w/1 MB of video mem-

JSC

Dates & Data

Today

Abstracts due: Abstracts are due April 7 for papers to be presented at the Joint Applications in Instrumentation, Process and Computer Control Symposium. The symposium is scheduled for April 28 at the University of Houston-Clear Lake. Topics include, but are not limited to, advanced control systems, communications, sensing and intelligent systems. For information call Kent Byerly at 333-6198.

Cafeteria menu: Special: fried chicken. Total Health: vegetable lasagna. Entrees: pollock hollandaise, beef stroganoff, vegetable lasagna. Vegetables: steamed broccoli, carrots vichy, Italian zucchini, breaded okra.

Monday

Cafeteria menu: Special: meat sauce and spaghetti. Total Health: potato baked chicken breast. Entrees: wieners and beans, sweet and sour pork chop, potato baked chicken, steamed fish, French dip sandwich. Soup: cream of broccoli. Vegetables: French cut green beans, seasoned rice, California vegetables, buttered beans.

Tuesday

Cafeteria menu: Special: smothered steak with dressing. Total Health: baked potato. Entrees: beef stew, liver and onions, shrimp Creole, baked chicken, fried cod fish, French dip sandwich. Soup: navy bean. Vegetables: steamed rice, seasoned cabbage, corn O'Brien, peas.

Wednesday

Astronomy seminar: The JSC Astronomy Seminar will meet at noon April 12 in Bldg. 31, Rm. 129. An open discussion meeting is planned. For information call Al Jackson at 333-7679.

Toastmasters meet: The Space-

land Toastmasters will meet at 7 a.m. April 12 at House of Prayer Lutheran Church on Bay Area Blvd. For information, contact Elaine Trainor, x31034.

PSI meets: The Clear Lake/NASA Area Chapter of Professional Secretaries International meets at 5:30 p.m. April 12 at the Holiday Inn on NASA Road 1. For information, contact Elaine Kemp x30556.

Cafeteria menu: Special: salmon croquette. Total Health: baked potato. Entrees: roast pork, stir frybaked perch, steamed fish, vegetable lasagna, Reuben sandwich. Soup: seafood gumbo. Vegetables: mustard greens, okra and tomatoes, vegetable sticks, lima beans.

Thursday

Learning lunch: The Total Health/ Employees Assistance Program will feature a lunch and Learn seminar at 11:30 a.m. April 13 in the small dining room of the Bldg. 3 cafeteria. Dr. Roger Harmon will discuss "Humor as a Stress Reliever. For information call Kathy Walck at x34868.

Sigma Xi meets: The Clear Lake Club of Sigma Xi will meet at 5 p.m. April 13 in Rm. 1418 in the Bayou Bldg. at the University of Houston-Clear Lake JSC Director Dr. Carolyn L. Huntoon will speak. Dinner tickets cost \$10 for members and \$11 for nonmembers. For information, call the UHCL/RICIS Program Office at 283-3815.

Cafeteria menu: Special: stuffed cabbage rolls. Total Health: baked potato. Entrees: beef tacos, ham and lima beans, pork and beef egg rolls, steamed fish, catfish, French dip sandwich. Soup: beef and barley. Vegetables: Brussels sprouts, green beans, buttered squash, pinto beans.

Friday

Cafeteria menu: Special: baked chicken. Total Health: roast beef au

jus. Entrees: deviled crab, baked chicken, beef cannelloni, steamed pollock, Reuben sandwich. Soup: seafood gumbo. Vegetables: seasoned carrots, peas, breaded okra, steamed cauliflower.

April 15

Easter party: The Employee Activities Association is hosting a children's Easter party from 10 a.m. - noon April 15 at the Gilruth. Tickets cost \$4 for kids, and \$1 for adults. Activities include a magic show, egg hunt, olympics obstacle course, hurricane hollow, dragon moonwalk, ball crawl, roundabout crawl, Easter egg painting, edible arts, face paints and picture with the Easter bunny. For more information call Katie Nguyen at x33185.

April 19

Astronomy seminar: The JSC Astronomy Seminar will meet at noon April 19 in Bldg. 31, Rm. 129. An open discussion meeting is planned. For more information, call Al Jackson at 333-7679.

Toastmasters meet: The Space-land Toastmasters will meet at 7 a.m. April 19 at House of Prayer Lutheran Church on Bay Area Blvd. For additional information, contact Elaine Trainor, x31034.

April 22

JSC picnic: The Employee Activities Association will host the annual JSC family picnic from 11 a.m. - 4 p.m. April 22 at Astroworld. Tickets cost \$20 and include all you can eat barbecue and foot long hotdogs, unlimited soft drinks, ice tea, ice cream, beer, all rides and attractions and a return ticket to Astroworld. Highlights include facepainters, caricature artist, bingo, volleyball, tetherball, tug-o-war, horseshoes and visits with the Looney Tune Characters. For more information call the Exchange Store at x35350.

'80; 2 bar stools, \$40/ea; computer desk, \$60. 486-4413.

Queen size motionless waterbed, executive side padding, 6 drawers, \$150. 992-2767.

Loveseat, brown velour print, good condition. 941-3262.

Couch, mauve velour, \$100/obo. Debbie, x47922 or 477-8560.

Pioneer stereo cabinet, wood grain w/glass door, lift top for T/T, 18"W x 16"D x 35"H, good cond, \$30. Doug, x48851 or 486-7412.

Wanted

Want personnel to join VPSI van pool, West Loop Park & Ride at 6:30 AM to NASA/contractors. Richard Heeterdicks, x37557 or Ed Rangel, x36124.

Want personnel to join VPSI Vanpool departing Meyerland Park & Ride lot at 7:05 a.m. for JSC, on-site personnel working the 8 a.m. - 4:30 p.m. shift, Travis Moebe, x45765 or Don Pipkins, x35346.

Want metal detector, salt water type preferred, regular type ok; Jon boat and/or motor. 482-0874.

Want clean safe garage apt or living area, CL, have small dog, no furniture needed. Becki, 480-9376.

Want low priced school/work car or truck. 271-7011.

Want donations for needy families w/infants, toys & clothes newborn up to size 6x. Bea, x31094 or 409-948-0282.

Want non-smoking new member to join 3-person carpool from Meyerland/Braeswood area, 8:00 am - 4:30 pm, possibly negotiable, 4 door car w/reasonable backseat space/seatbelts required. Al, x36603 or Mel, x30116.

Want Mickey Mouse cookie jar \$10- \$15 or piggy bank, \$5 - \$8. Bea, x31094 or 409-948-0182.

Want roommate(s), 4-2.5-2, 2 story house, Seabrook, separate living areas, additional phone lines, cable, washer/dryer, extra storage, \$350/mo. 474-4742.

Want to buy used canoe in any condition. 554-7499.

Want to share 3-2, house in LC, non-smoking, \$350/mo + 1/2 utilities + dep. Cliff, 334-3940 or 482-4610.

Want 2 drawer or 4 drawer file cabinet, wood preferred. 334-7258.

Want low priced peripheral or IC cards for Sharp Wizard Oz-9520. Tony, x47401 or 482-4156.

Want to buy '89 Buick Park Avenue car cover, need asap. 990-5543.

Want ultimate frisbee players, no experience necessary, will teach you, Mon, Wed, 7:30-9:00 pm. Dan, 282-5239 or 486-1102.

Want a yearling to small horse show halter for Quarter horse. 585-4101.

Miscellaneous

Day timers Planners w/zipper notebook, full 8.5 x 11 size, desk paper punch, filler thru Sept, '95, \$60; 14kt gold diamond-cut rope bracelet, 7", 2.5 mm wide, \$50. Eric, x31917.

Portable basketball goal, acrylic backboard, ex condition, \$100. 333-6456 or 480-8682.

Wedding ring set, .5 carat diamonds w/4 rubies, 14k gold size 7, new \$1.4k sell \$800/obo. x33027.

Coleman rooftop air conditioner with heater, \$250. 554-6138.

Pinch-pleated, fully lined, rosy plum drapes, ex condition, 4-37"x84" panels, 5-35' swags, 2 cascades, 3 ties, sheers, hardware, \$300; Nordic Track Achiever, new \$830 sell \$600. Janine, x45084 or 482-7550.

Designer wedding dress w/veil & slip, \$800; racks for cars with rain gutters, \$75. Su, x45722.

Victorian wedding gown, beautifully detailed, off-the-shoulder, fitted to the waist, lovely bustle and long train size 5-6, new \$950 sell \$250. 337-4182.

Radial arm saw, \$300; band saw, \$200; router, \$75; drill press, \$200; belt/disk sander, \$150; wood lathe & grinder, \$150; sawzal, \$75. 479-1015.

Men's Wrangler jeans, like new, 3 pairs size 30x34, 1 pair 31x32, 1 pair 31x33, \$8/pr; ladies colored Wrangler jeans, size 7x36 & 9x36, \$9/pr. 470-1455.

Huffy 10 speed bike, \$50/obo; pink umbrella stroller, \$20/obo; toddlers trikes wagon, \$5/ea. Ed, 481-4889.

Winchester 12 gauge shotgun semi-auto, 28" barrel, \$250. James, 991-0533.

Above the ground pool, 15'x27', pump, filter, ladder, & chemicals, needs new liner, you dismantle & deliver, \$200. Don, x34598.

Barometer, 3 gage, \$10; Pencil plants Banana plants, \$6.50/ea; TV cart, \$15. 488-5564.

"Hooked on Phonics" used 6 times, new \$350 sell \$200/obo. 946-2581.

Childs saddle, rarely used. 585-4101.

Black leather car mash for Honda CRX SI, \$50; blue water resistant car cover for medium size cars, \$40. Su, x45722.

Sears rowing machine, \$50; stairclimber, \$305. 328-3840.

Fisher Price, record player, \$10; baby float, \$10; biobottoms diaper covers, all cotton & wool, waterproof w/no plastic lining, sizes range from newborn to 22 lbs, new \$16 sell \$5/ea. Sharon, x8506.

Red decorative Lava rock for use in landscaping. x32582.

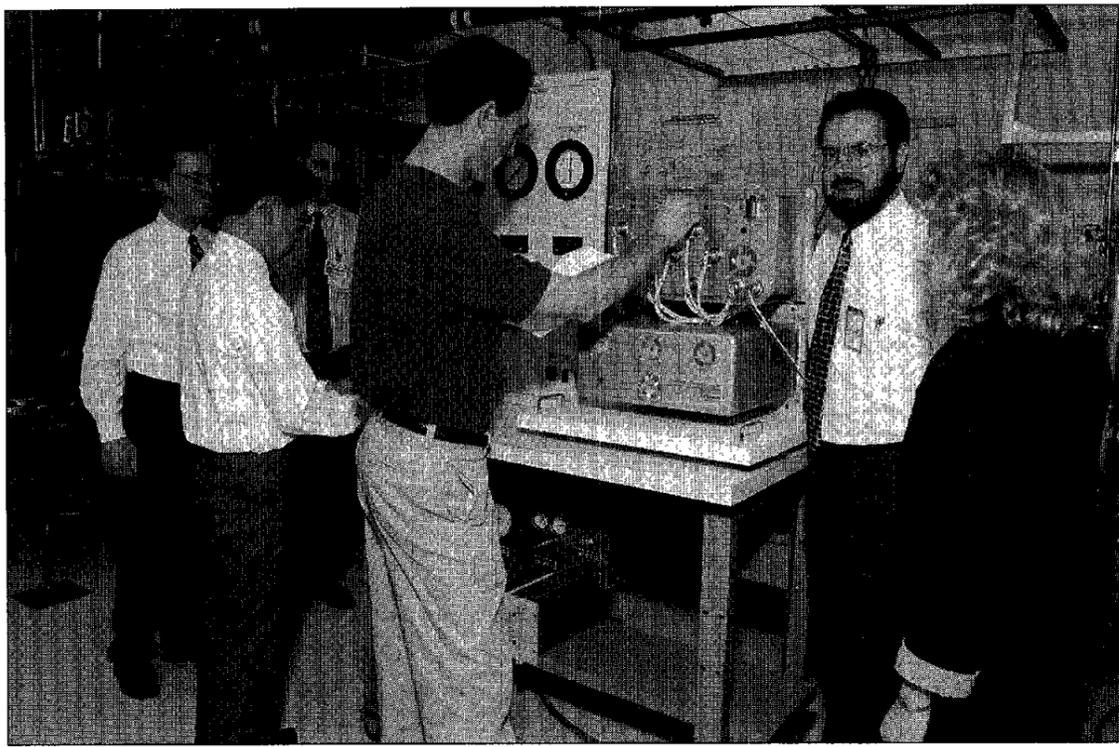
HEPA air filter for home A/C, 5 ton max, \$75; Gerry booster auto seat, very clean, model #675, \$25. Doug, x48851 or 486-7412.

Selling house, must sell furniture. 482-4610.

Ariens riding mower with new engine, \$375; PVC patio furniture, 2 chairs, 2 end tables, love seat/glider, \$150/set or sell individually. 486-4413.

Panasonic EB-500 car phone, hands-free hidden microphone, 40 number memory, requires activation, \$75/obo. 474-3366.

Cross stitch materials, complete kits, bibs, patterns, frames, Laguana & Aida cloth, all sizes, all colors. Faye, 470-1455.



An EPICS Adventure

JSC team research on oxygen producing electrolysis cells is set to fly on STS-69

By Karen Schmidt

Cutting edge research at JSC could one day provide space station astronauts with every other breath they take. The new system is being developed to supply oxygen to the space station more safely and cheaply than current methods.

The Electrolysis Performance Improvement Concept Study is an electrolysis cell that uses a chemical reaction to separate water into hydrogen and oxygen. EPICS is scheduled to fly in August on STS-69 on Endeavour's middeck.

The electrolysis cell is the major part of a larger system called the Static Feed Electrolyzer. The SFE could become the main life support source for astronauts on the space station, and the experiment under development at JSC will verify microgravity performance of the electrolysis reaction that produces the oxygen.

Estimates show that up to 12,000 pounds could be shaved off of the International Space Station yearly resupply needs by the SFE system supplying the oxygen for a six-person crew, with allowances for animals and crew compartment leakage.

"It's a lot safer and more efficient to transport water than high pressure oxygen," said Project Manager Sandra Foerg of the Life Support and Thermal Systems Branch in the Crew and Thermal Systems Division.

The entire SFE system will be integrated at Marshall Space Flight Center after data from this experiment is analyzed and a best method is determined.

"They will be able to use the information we learn from this experiment to develop the actual working model for the station," Foerg said.

An electrolysis cell is comprised of a hydrophilic matrix sandwiched between two porous electrodes. The matrix contains water and potassium hydroxide electrolyte to provide an electrical path between the electrodes. When a current is applied to the electrodes across the cell, hydrogen is produced at one electrode and oxygen at the other.

Three different cells are included in the EPICS experiment scheduled for flight on STS-69. One is a baseline cell, the second has a slightly thinner matrix in the middle and the third has different electrodes.

"We are looking at different configurations because we think that in zero-g the potassium hydroxide is more equally distributed and we want to find the best configuration for maximum performance," Foerg said.

The STS-69 crew will have very little interaction with the unit, Foerg said. "Basically, just turn the unit on and keep the filters in the fans clean and turn it off," she said.

The flight demonstration experiment is totally self contained. Water already is in the system and the team has modified the system by adding cells to recombine the hydrogen and oxygen.

The unit also has an internal computer that will control and monitor the tests. The computer is capable of shutting down the unit if the experiment violates any safety requirements. The computer will collect all the data and scientists will be able to analyze the data after flight to determine which type of cell worked best, Foerg added.

Foerg said the EPICS project was a team effort with several players contributing to the preparation for flight.

Principal investigator Franz Schubert developed and built the hardware in cooperation with Dr. M. Gene Lee and Jim Khoury. All work for Life System Inc., based in Cleveland.

"During the experiment development, we had some safety requirements that had to be met," Foerg said. "John Steils, our representative to the safety panel, really helped with the follow-ups."

Other key players were Charlie Katsikas of the Shuttle Safety and Mission Assurance Division of the Safety Reliability and Quality Assurance Directorate, who provided reliability requirements and Lockheed's Gary Deardorff, who prepared safety review information and Warren Ruummele, who coordinated the flight certification test at JSC.

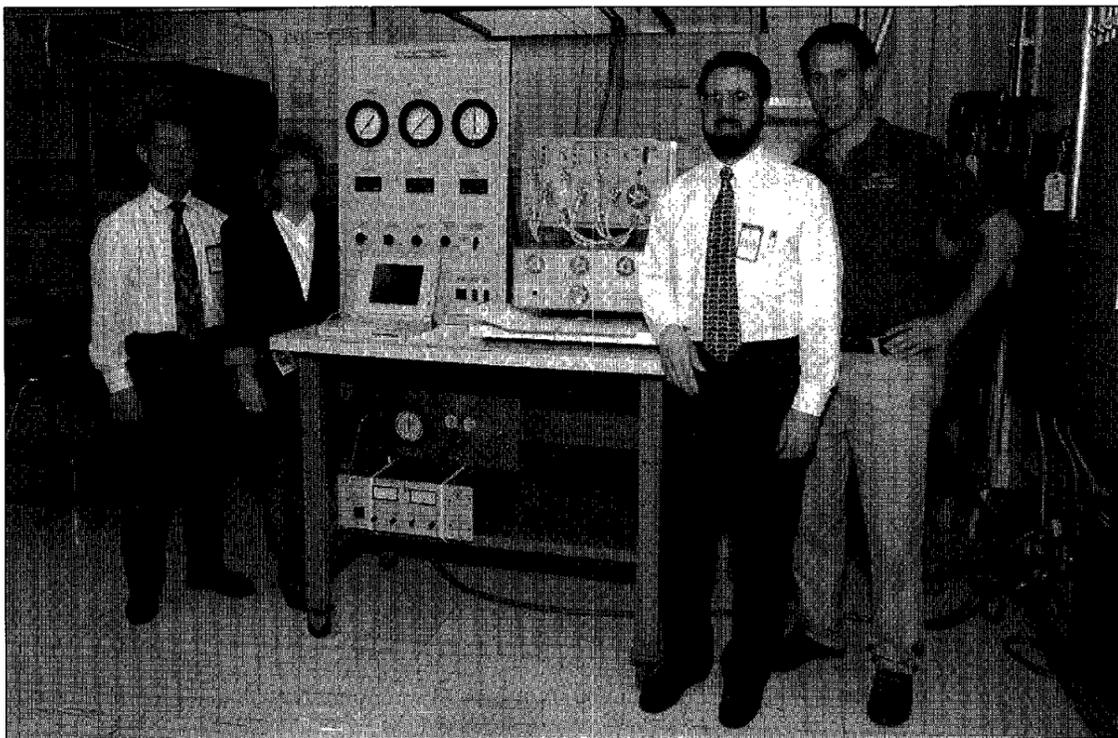
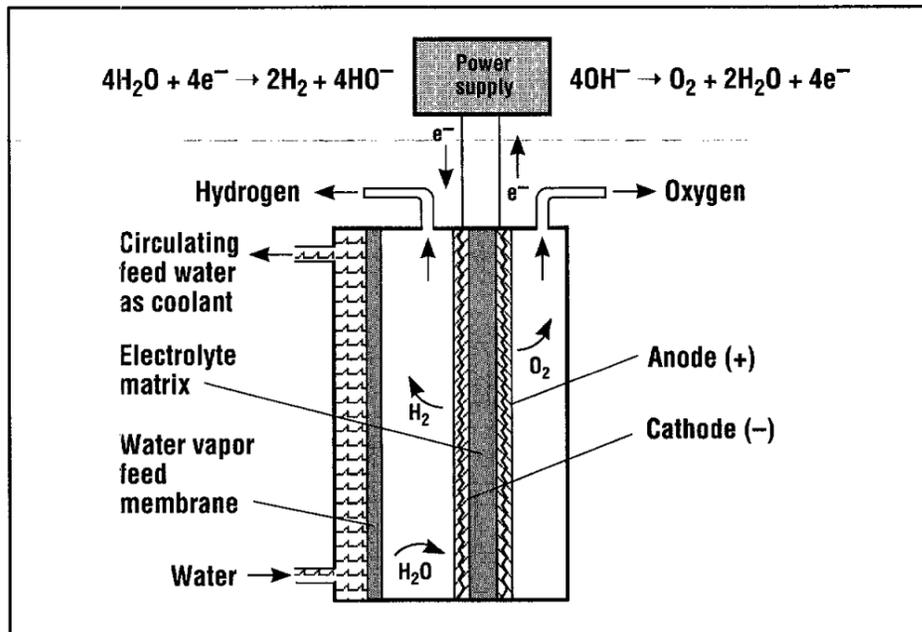
Roger Schwartz of the EVA and Spacesuit Systems Branch in the Crew and Thermal Systems Division helped the team with flight integration aspects while Attibele Shamala of Lockheed, Glenn Ecord of the Materials and Failure Analysis Branch in the Manufacturing Materials and Process Technology Division, Rob Moreland of the Project Support Branch in the Propulsion and Power Division and others helped to ensure the experiment is safe to fly.

Interactions with the payload integration manager Al Ong of the Customer and Flight Integration Office were extensive. Ong helped with requirements to ensure the experiment would fit into the middeck and served as a liaison for interactions with Kennedy Space Center personnel.

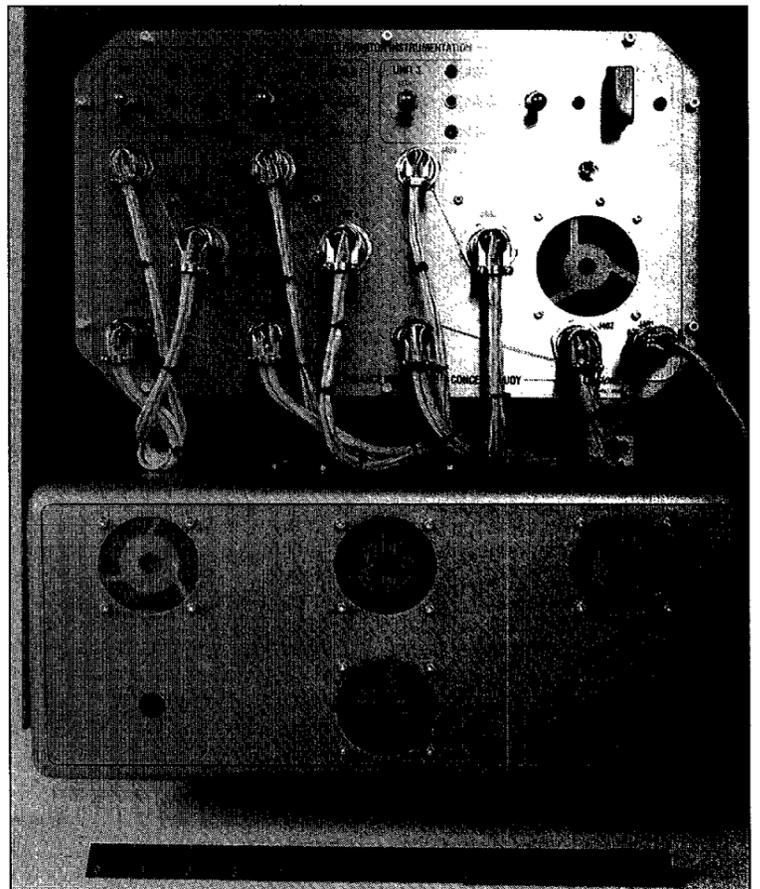
Foerg said the original project manager, Bob Cusick, was responsible for getting the project off the ground. Foerg took over as project manager two years ago after Cusick's became ill with cancer. Cusick died in January 1994 and was not able to see the results of the project.

The future looks bright for electrolysis research, she added, and may play an important role in meeting NASA's needs for future space missions. In addition to providing life support for astronauts, both the hydrogen and oxygen produced by the SFE may be used in a variety of processes including spacecraft propulsion, space walks, electrical power generation and storage, and scientific experiment and manufacturing processes.

The flight experiment is sponsored by NASA Headquarters' Office of Space Access and Technology as part of the In-Space Technology Experiments Program, or In-STEP. □



Top: STS-69 Mission Specialist Jim Newman, center, learns the operations of the Electrolysis Performance Improvement Concept Study as team members look on. From left, Gary Deardorff of Lockheed, Dr. R. Gene Lee of Life Systems Inc., Warren Ruummele of Lockheed, Newman, Jim Khoury of Life Systems Inc. and Sandra Foerg, project manager of the Life Support and Thermal Systems Branch. Center: An electrolysis cell is comprised of a hydrophilic matrix sandwiched between two porous electrodes. When a current is applied to the electrodes across the cell, hydrogen and oxygen is produced. Bottom left: EPICS team members, from left, Lee, Foerg and Khoury help Newman learn the system and its essential components. Bottom right: EPICS is self contained with three different electrolysis cells and a computer for data collection in one unit.



JSC Photos by Mark Sowa

Hubble data suggest galaxies have giant halos

NASA's Hubble Space Telescope has helped solve a two-decade-old cosmic mystery by showing that mysterious clouds of hydrogen in space may actually be vast halos of gas surrounding galaxies.

"This conclusion runs contrary to the long-standing belief that these clouds occur in intergalactic space," says Ken Lanzetta of the State University of New York at Stony Brook.

The existence of such vast halos, which extend 20 times farther than the diameter of a galaxy, might provide new insights into the evolution of galaxies and the nature of dark matter—an apparently invisible form of matter that surrounds galaxies.

The possibility of galaxy halos was first proposed in 1969 by John Bahcall and Lyman Spitzer of the Institute for Advanced Study. Previous observations with ground-based telescopes, the International Ultra-

violet Explorer satellite, and Hubble have suggested that these clouds might be galaxy halos. However, the latest results are the most definitive finding yet, says Lanzetta, because they come from a large sample of 46 galaxies.

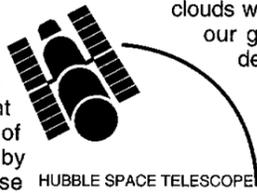
For the past two decades, observations with ground-based telescopes have shown that the light from distant quasars (the bright cores of active galaxies) is affected by intervening gas clouds. These clouds are invisible, but betray their presence by absorbing certain frequencies, or colors, of a quasar's light. When a quasar's light is spread out into a spectrum, the missing wavelengths appear as a complex "thicket" of absorption features. Ground-based observations also showed that the number of these clouds rapidly rises out to

greater distances. However, in 1991, independent observations made with Hubble's Faint Object Spectrograph and Goddard High Resolution Spectrograph instruments detected more than a dozen hydrogen clouds within less than a billion light-years of our galaxy. These clouds could not be detected previously because they are only visible in the ultraviolet part of the spectrum, which is inaccessible with ground-based telescopes. This gave astronomers a powerful opportunity to further test the halo theory by imaging

nearby galaxies and attempting to match them with nearby clouds. Lanzetta, David Bowen of the Space Telescope Science Institute, David Tyler of the University of California at San Diego, and John Webb of the University of New South Wales in Australia, attempted to match

galaxies and clouds by first collecting Hubble archival data on six quasars. Next, using telescopes at The National Optical Astronomy Observatory, the Anglo Australian Observatory, the Lick Observatory and the Isaac Newton Telescope, they identified galaxies near the clouds and measured distances. In the majority of cases they found galaxies within about 500,000 light-years of the clouds. The results explain why so many clouds are seen at greater distances: the light from distant quasars was more likely to pass through a galaxy's halo because the halo is so large.

The Space Telescope Science Institute is operated by the Association of Universities for Research in Astronomy Inc. for NASA, under contract with the Goddard Space Flight Center. The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency.



HUBBLE SPACE TELESCOPE

NASA signs new booster agreements

NASA continues on a fast track with its reusable launch vehicle technology program with the signing of four cooperative agreements to design the next generation boosters known as the "X-33 and X-34."

"This is a critical step in positioning the United States as a competitive player in the commercial space marketplace of the future," NASA Administrator Daniel S. Goldin said.

The X-33 cooperative agreements were signed with Lockheed Advanced Development Co., McDonnell Douglas Aerospace, and Rockwell International Corp.'s, Space Systems Division. Over the next 15 months, known as "Phase I," the agency will work with these companies on concept definition and design of a vehicle intended to demonstrate the technology required for a 21st-Century commercial reusable space launch system.

NASA will provide approximately \$7 million to each of the three participants during this design phase, with each expected to invest a matching sum in the venture.

NASA and Orbital Sciences Corp. signed a cooperative agreement to jointly develop a small, reusable space booster—the "X-34"—which will serve as a test bed to demonstrate reusable vehicle technology.

The X-34, with potential of becoming a commercial booster, is expected to reduce costs for 1,000 to 2,000-pound payloads into low-Earth orbit. Flight tests are planned for late 1997, with launch by mid-1998. At that time, technology test bed applications will feed directly into plans for developing the larger X-33.

NASA plans to provide \$70 million to Orbital Sciences Corp. through fiscal 1999 for X-34 development. The company will invest at least an equal amount of its funds.

Cashier hours new

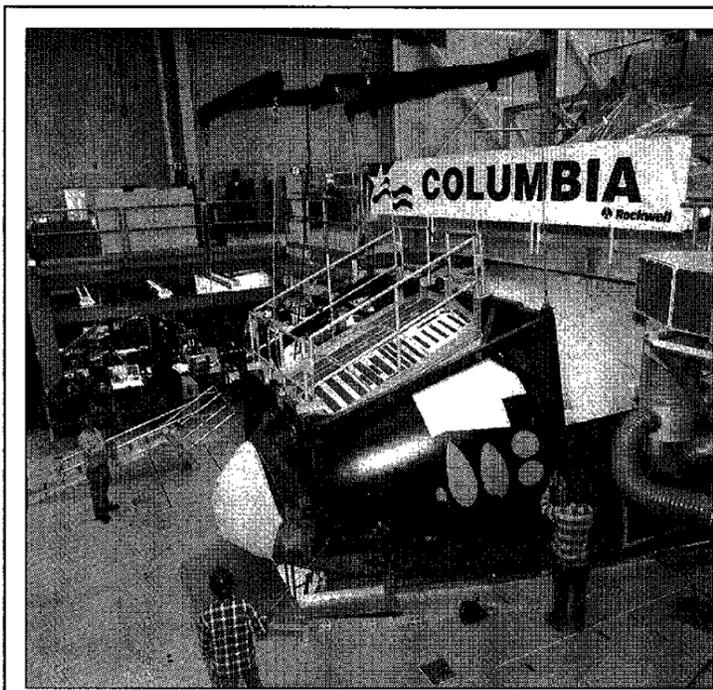
The Financial Management Division is relocating its collection agent and changing the cashier and travel funding hours of operation.

The collection agent, who receives all money owed to JSC, recently moved from Bldg. 1, Rm. 119, to Bldg. T585, Rm. 122. T-585 is in front of Bldg. 29, the Weightless Environmental Training Facility. Hours of operation remain the same from 8 a.m.-4 p.m. Monday-Friday and the phone number is x30560.

The cashier, who provides travel advances and reimbursements, will continue to operate in Bldg. 1, Rm. 119. Beginning Wednesday, hours of operation will be 12:30-3:30 p.m. Monday-Friday with additional hours from 9-11 a.m. Friday. The cashier's phone number is x34541.

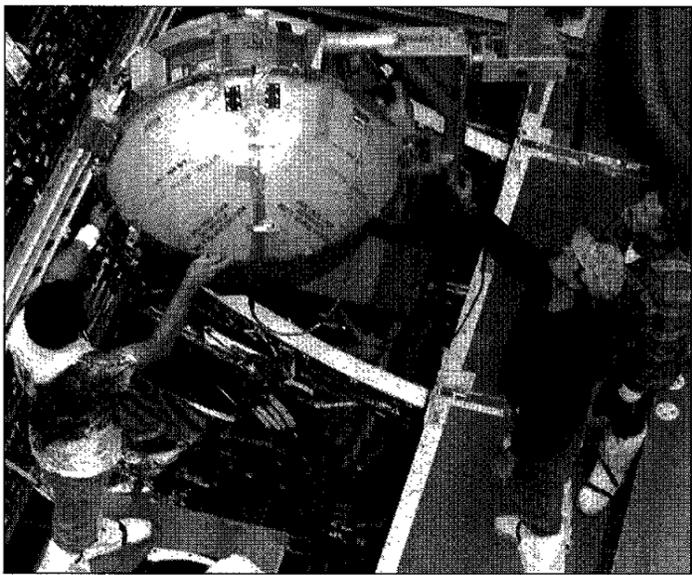
Travel funding, which processes travel orders in Bldg. 1, will provide customer service from 8:30 a.m.-noon and 1-5 p.m. Monday-Friday. The phone number is x30561.

For additional information call Deborah Conder, chief of the Payroll, Labor and Travel Accounting Branch at x38505.



NASA Photos

BACK IN ACTION—The Space Shuttle *Columbia* is nearly ready to head back to the launch pad following six months of maintenance work and hardware improvements. Top: Engineers at Rockwell International in Palmdale, Calif., work on *Columbia's* forward reaction control system with the lower forward fuselage. Bottom: Renovations included work on hydrogen tank in the main fuselage. If weather conditions permit, *Columbia* could make an overnight stop Tuesday at Ellington Field, where JSC employees would be allowed to inspect the orbiter.



Gore letter praises Carter

(Continued from Page 1)

ing is intended to support," Mott said. Mott also read a letter from Vice President Al Gore stating that Carter "excelled both as a scientist and an explorer. Sonny's accomplishments as student, a physician, a professional athlete, a naval aviator and an astronaut stand as an impressive tribute to his very full and diverse life."

Carter's dream of living aboard the space station must be carried forward by his colleges and friends, Gore added. Carter's colleague Norm Thagard voiced down remarks from the Mir space station.

The facility, built by McDonnell Douglas for assembling space station components, will be modified to house a neutral buoyancy laboratory for training shuttle and station astronauts and cosmonauts. The facility

will be a critical part of shuttle and station operations from training astronauts to developing techniques for assembly of the space station. Construction on the pool, electronics and assembly areas begins April 3.

"Sonny was a driving force in a number of advances we made in the field of space medicine, particularly on evaluation of the Extravehicular Mobility Unit," Huntoon said. "Sonny Carter left a lasting impression on the Johnson Space Center and our nation's space program."

McDonnell Douglas Aerospace, aware of congressional interest in naming the facility for Carter, agreed to the naming of the building now. Formal dedication of the building as a NASA-owned facility is expected to occur when the training pool is complete in 1996.

Learn to laugh at stress over lunch

Feeling a little bit "stressed out" at work or at home?

The Employee Assistance and Total Health Programs are offering employees a unique way to deal with the stress and strain of everyday life at a lunch and learn seminar set for 11:30 a.m. Thursday.

"Stress is an unavoidable part of life," said Kathy Walck of the EAP.

"Since April is National Humor Month, it seemed appropriate to show employees how they can use humor to deal with the stress they experience everyday."

The lunchtime seminar—"Humor as a Stress Reliever"—will be taught by Roger Harmon, director of education at Samaritan Counseling

Center. Harmon will use his expertise as a counselor and therapist to demonstrate techniques employees can use to manage and reduce that "stressed out" feeling.

Harmon holds a master of divinity from St. Paul School of Theology and a doctorate of ministry in pastoral counseling in psychotherapy from Garrett Evangelical Seminary. He also is a state licensed professional counselor specializing in family therapy.

The seminar will be held in the small dining room in the Bldg. 3 cafeteria and is a part of the Total Health Program.

For additional information on the seminar or other EAP services, contact Walck at x34868.



total health

Sign up on-site for classes

In cooperation with the Cullen School of Engineering at the University of Houston, JSC again will be offering a graduate engineering course on-site via satellite for the summer 1995 term.

As a convenience to JSC employees and contractors, on-site registration for Industrial Ergonomics and all other UH engineering courses will be held from 10:30 a.m.-2 p.m. Monday in the lobby of Bldg. 45.

Registration forms for UH are available in the Human Resources Development Branch located in Bldg. 45, Rm. 146. JSC employees

may submit a completed application for training, Form 75, as payment for engineering courses. Contractor employees will receive an invoice from UH.

If you are interested in applying for admission to UH, applications will be available at the registration site. All applicants and all new students must bring their undergraduate transcript with the degree posted. All new students should keep in mind that only six hours taken as a post-baccalaureate student may be transferred to graduate credit.

For additional information, contact Kazuko Hall at x3075.

Thagard passes shuttle record

(Continued from Page 1)

18 days in space. By the end of his three-month mission, Thagard will hold the all-time United States record for time in space, eclipsing the current record of 84 days set by the third Skylab crew in 1974.

Thagard's time on Mir has been filled with a number of investigations designed to study the human body's adaptation to long-term space flight and to characterize the environment on the space station.

Last week, Thagard donned a monitor to gather data on his blood pressure and heart rate. This information will help investigators establish baseline condition of the crew members' cardiovascular system.

Thagard also spent about 30 minutes last week in the Russian Chibis suit. The Chibis suit is simi-

lar to the Lower Body Negative Pressure unit used on the space shuttle. While the devices do not resemble each other physically, the protocols used on Mir will be similar to the protocols used on the shuttle to allow investigators to compare results. The two devices help pull body fluids back down to the lower extremities, exercising the cardiovascular system through negative pressure to the lower body.

Mir 18 crew members this week also continued to log their fluid, food and drug intake, and to collect air and water samples to help investigators characterize the environment on the Russian station. In addition to the science activities, the cosmonauts installed a condenser in the station's air conditioning system.

Launch sequence under review

(Continued from Page 1)

Meanwhile, work continues to prepare *Discovery* for its launch on the STS-70 mission to deploy the next Tracking and Data Relay Satellite for NASA's communications network.

Discovery's liftoff, currently slated for late June, could either be advanced or delayed, pending the

final resolution of a firm launch date for *Atlantis* on the STS-71 mission.

Workers are preparing to install *Discovery's* three main engines while shuttle officials assess their options before determining the final sequence in which the next three missions will be launched through the end of the summer.